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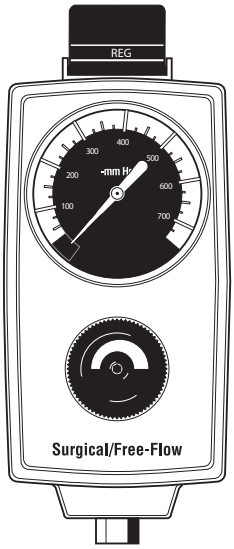
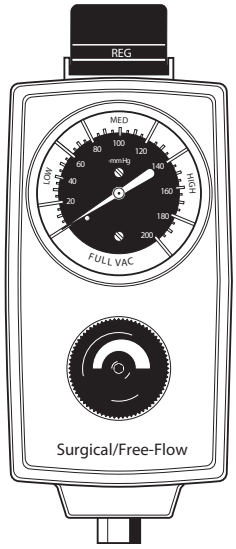
# Surgical/Free-Flow Vacuum Regulators

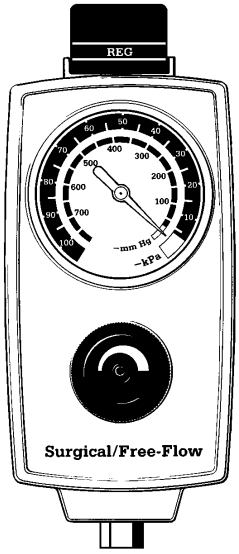
## Service Manual



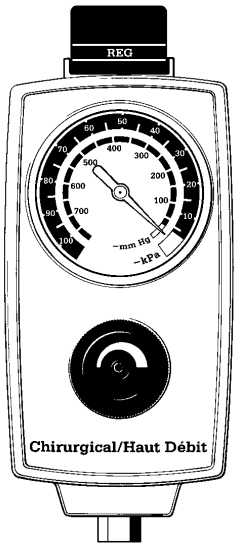

North American
High



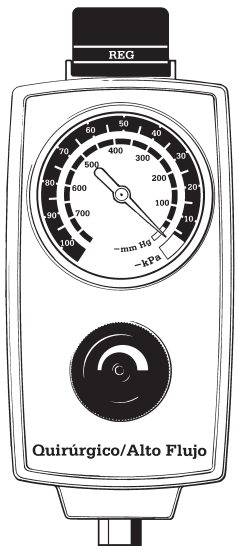

North American
Standard




English
High




French
High




Spanish
High

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## 1.1 Definitions

**Note:** A Note provides additional information to clarify a point in the text.

**Important:** An Important statement is similar to a note but of greater emphasis.

⚠**CAUTION:** A CAUTION statement is used when the possibility of damage to the equipment exists.

⚠**WARNING: A WARNING statement is used when the possibility of injury to the patient or the operator exists.**

European Union Representative

## 1.2 Warnings

The Pre-Use Checkout Procedure must be performed before using this equipment on each patient. If the regulator fails any part of the Pre-Use Checkout Procedure, it must be removed from service and repaired by qualified service personnel.

Always connect the regulator to the vacuum source and check its operation before attaching the patient connection.

Connect the Vacuum Regulator to the vacuum source only. Connection to pressure sources even momentarily could injure the patient or operator and damage the equipment.

The fitting port of the regulator must be occluded when setting the prescribed suction level. This prevents the patient from receiving higher than required suction levels.

Do not use this device in the presence of flammable anesthetics. Static charges may not dissipate and a possible explosion hazard exists in the presents of these agents.

After patient use, regulators may be contaminated. Handle in accordance with your hospital's infection control policy.

Clean and sterilize all suction equipment before shipment or service to ensure transportation personnel and/or service personnel are not exposed to any hazardous contamination.

Clean and sterilize all suction equipment if contaminated before disassembly, to ensure service personnel are not exposed to hazardous contamination.

Following sterilization with ethylene oxide, parts should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the material. Aerate parts for 8 hours at 130oF (54oC).

If the Vacuum Regulator is repaired or disassembled in any manner, the Service Checkout Procedure must be performed before using the equipment on the patient.

## 1.3 Cautions

Cleaning the gauge may result in damage.

Do not steam autoclave or liquid sterilize the Surgical/Free-Flow Vacuum Regulator. Severe impairment to the operation of the regulator will result. The only acceptable method of sterilization is with gas (ethylene oxide).

Do not use any [1]Loctite® products to seal the fitting and adapter port threads (or products which contain Methacrylate Ester as an active ingredient).

Only competent individuals trained in the repair of this equipment should attempt to service it.

Sterilization with ethylene oxide mixtures may cause crazing (minute superficial cracking) of some plastic parts. Crazing will be more pronounced when mixtures containing [2]Freon® are used.

The gauge assembly must be handled with utmost care to retain its precision. If the lens is removed, do not rest the gauge on its face.

To help prevent aspirate from entering the regulator as a result of misuse, an Overflow Safety Trap and suction filter should be attached prior to its use. Aspirate in the regulator will impair the operation. The use of the Overflow Safety Trap and suction filter will help prevent this and extend the life of the suction equipment.

To prevent stripping the plastic threads, place the screw in the hole and turn counterclockwise until it drops into the original threads. Tighten screw.

Use of lubricants other than recommended may degrade plastic or rubber components.

**Not for Field or Transport Use

[1] Loctite is the registered trademark of the Loctite Corporation
[2] Freon is the registered trademark of the DuPont Co.
**The categories of Field and Transport Use are specifically defined in ISO 10079-3 (BS 7259: Part 2). "Field" means use at accidents or emergencies outside a hospital. "Transport" means use in ambulances, cars and airplanes. These situations may expose the equipment to uneven support, water, dirt, mechanical shock and temperature extremes. Ohio Medical suction equipment has not been tested to comply with the specific requirements of these categories.

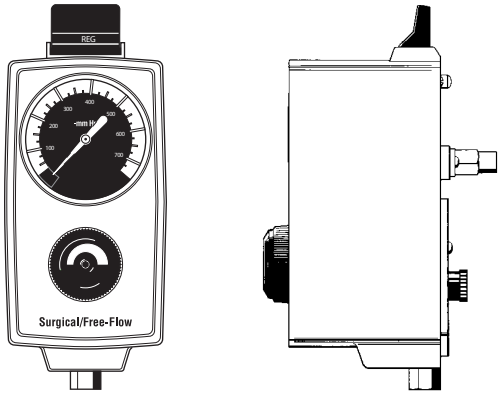
# 2/Scope

This service manual contains service, maintenance, and parts information on five models of Surgical/Free-Flow Vacuum Regulator:

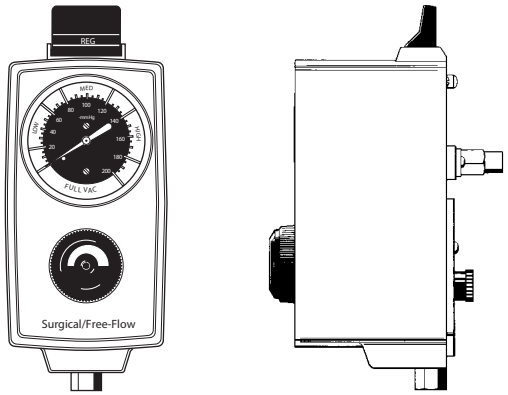
North American (2)
English (1)
French (1)
Spanish (1)

## 2.1 North American Surgical/Free-Flow Vacuum Regulators

**Note:** Part numbers given are for Vacuum Regulators without fittings or adapters.



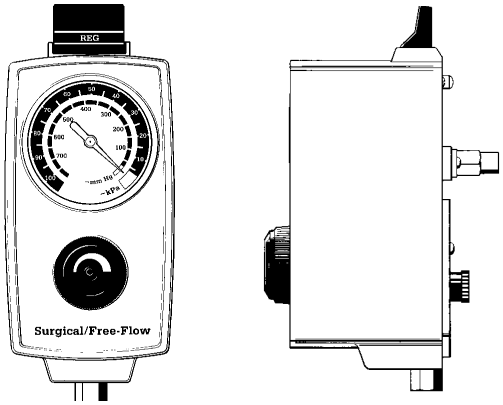

High
6700-1247-900
0-700 mm Hg




Standard
6700-1246-900
0-200 mm Hg

## 2.2 English Surgical/Free-Flow Vacuum Regulator

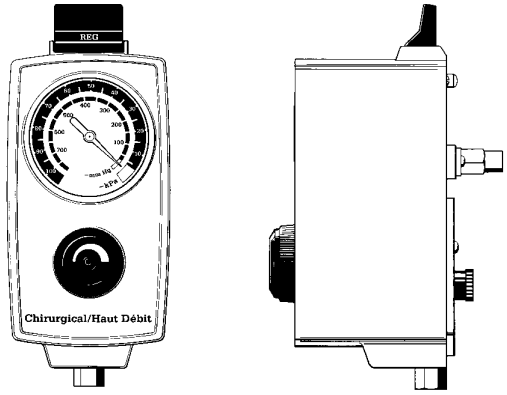
**Note:** Part numbers given are for Vacuum Regulators without fittings or adapters.




6700-1248-900 (High)
Counterclockwise
0-760 mm Hg/0-100 kPa

## 2.3 French Surgical/Free-Flow Vacuum Regulator

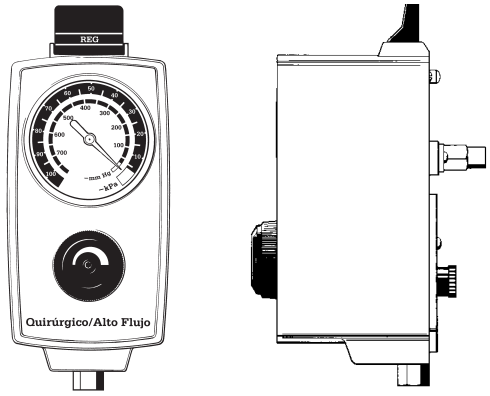
**Note:** Part numbers given are for Vacuum Regulators without fittings or adapters.




6700-1249-900 (High)
Counterclockwise
0-760 mm Hg/0-100 kPa

## 2.4 Spanish Surgical/Free-Flow Vacuum Regulator

**Note:** Part numbers given are for Surgical/Free-Flow without fittings or adapters.




6700-1250-900 (High)
Counterclockwise
0-760 mm Hg/0-100 kPa

## 3.1 Description

**⚠WARNING: Do not use this device in the presence of flammable anesthetics. Static charges may not dissipate and a possible explosion hazard exists in the presents of these agents.**

The Surgical/Free-Flow Vacuum Regulator is designed for applications in high use areas where high flow rates and minimal maintenance requirements are of significant benefit.

Flow rates of up to 150 LPM are made possible by the use of a large bore, unobstructed passage through the regulator. In place of the conventional diaphragm-valve assembly, the regulator uses a unique device called a regulating bar to control suction. During use, as the flow requirement increases, the regulator bar automatically opens to maintain suction at the preset level. When the flow requirement decreases, the regulator bar automatically closes to maintain suction at the preset level. The same mechanism compensates for changes in supply vacuum to automatically maintain the pre-set suction level.

This unique design adds reliability and extended service life because it isolates the regulating apparatus and gauge from the vacuum circuit, preventing damage from aerosols and contaminants. For added durability, the regulator is housed in an impact resistant case.

All models contain a vacuum gauge which indicates suction supplied by the regulator. Both High Vacuum (0-760 mm Hg/0-100 kPa) and Standard (0-200 mm Hg/26 kPa) options are available.

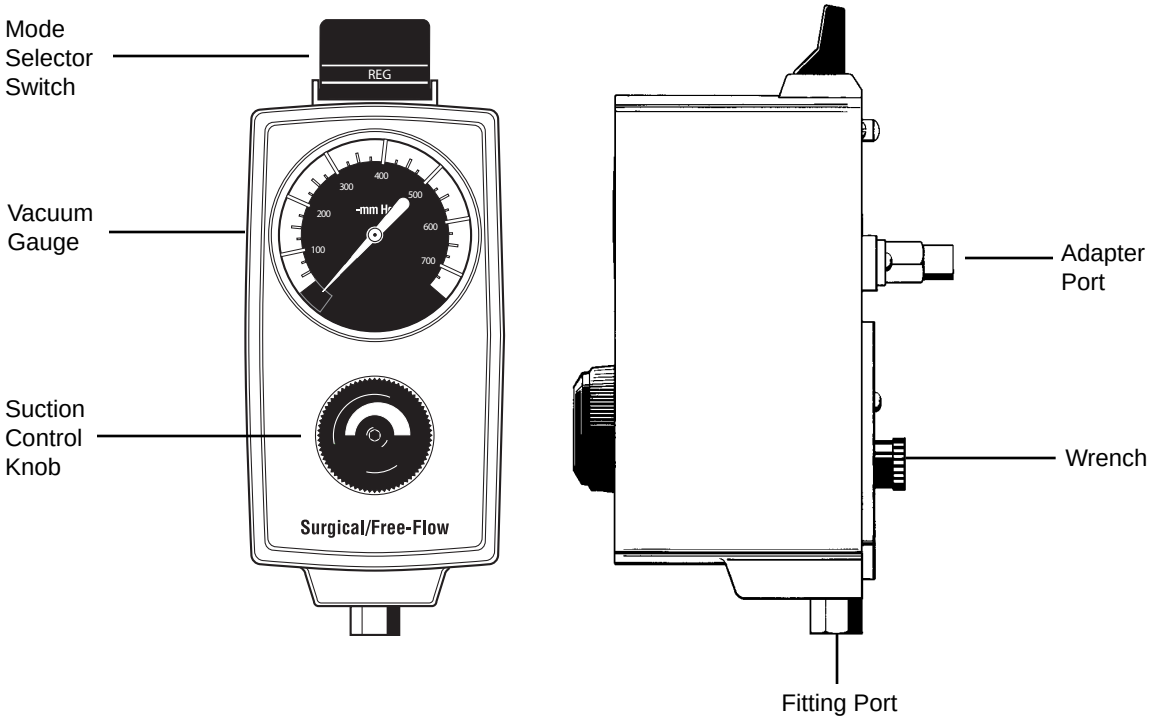
The Surgical/Free-Flow regulator is available with a wide variety of direct mounting and bracket mounting configurations. These configurations enable the regulator to be used with virtually any centrally piped system. The regulator can be easily disassembled for maintenance and cleaning.

1. Suction Control Knob - allows easy adjustment of suction to the patient.

2. Mode Selector Switch - allows quick and easy mode changes.

   a. OFF/O - No suction is supplied to the patient.
   b. REG/| - Suction can be adjusted with the suction control knob.

3. Vacuum Gauge - The suction level to the patient is displayed during use.




Front and Side View

## 3.2 Specifications

| | |
|---|---|
| Gauge: | Accuracy: ±5% of full scale deflection |
| Flow Rate: | 0-150 LPM without fittings at full increase setting depending on supply vacuum and open air flow. |
| Regulated Suction Ranges: | |
| Standard Model | 0 to 200 mm Hg/0 to 26 kPa |
| High Models | 0 to 760 mm Hg/0 to 100 kPa |
| Weight: (Less Fittings) | 22 oz/630 grams |
| Dimensions: (Less Fittings) | Height: 7 inches/179 mm<br>Width: 3.5 inches/89 mm<br>Depth: 4.6 inches/118 mm |
| Latex Tubing, 0.25 in (6.4 mm) I.D. X 12 in (30 cm) supplied: | 0 to full vacuum<br>Flow dependent on source and setup |
| Disposable tubing (Available separately in some markets; 6 mm I.D. X 450 mm, 750 mm and 2M) to connect regulator and collection bottle | 0 to full vacuum<br>Flow dependent on source and setup |
| Disposable Suction Filter: | 0 to full vacuum<br>0 to 100 Lpm @ 650 mmHg (-87 kPa) |

**Environmental Specifications**

| | |
|---|---|
| Operating Temperature Range: | $40^{o}$F ($4^{o}$C) to $120^{o}$F ($49^{o}$C) |
| Storage Temperature Range: | $0^{o}$F (-18oC) to $160^{o}$F ($71^{o}$C) |
| Operating and Storage Relative Humidity | 5 to 95% |

## 4.1 Equipment Set-up

**⚠WARNING: Connect the Vacuum Regulator to the vacuum source only. Connection to pressure sources even momentarily could injure the patient or operator and damage the equipment.**

**⚠WARNING: Always connect the regulator to the vacuum source and check its operation before attaching the patient connection.**

**⚠CAUTION:** To help prevent aspirate from entering the regulator and Overflow Safety Trap and suction filter should be attached prior to its use. Aspirate in the regulator will impair the operation. The use of the Overflow Safety Trap and suction filter will help prevent this and extend the life of the suction equipment.

If the regulator is equipped with an adapter for wall outlets, insert the adapter into the vacuum wall outlet. If the regulator is mounted elsewhere, connect a vacuum supply hose between the regulator's adapter port and the wall outlet. Connect the Collection Bottle's vacuum port to the regulator's fitting or Overflow Safety Trap with the appropriate vacuum tubing.

**Note:** For proper installation of Adapters/Probes and Fittings see Appendix.

Hospital-supplied suction tubing must be used between the catheter and the collection bottle. Recommended minimum inside diameter is 0.25 in (6 mm).

An Ohio Medical High Flow Disposable Filter should be used between the Collection Bottle and the Vacuum Regulator to prevent contamination of the regulator.

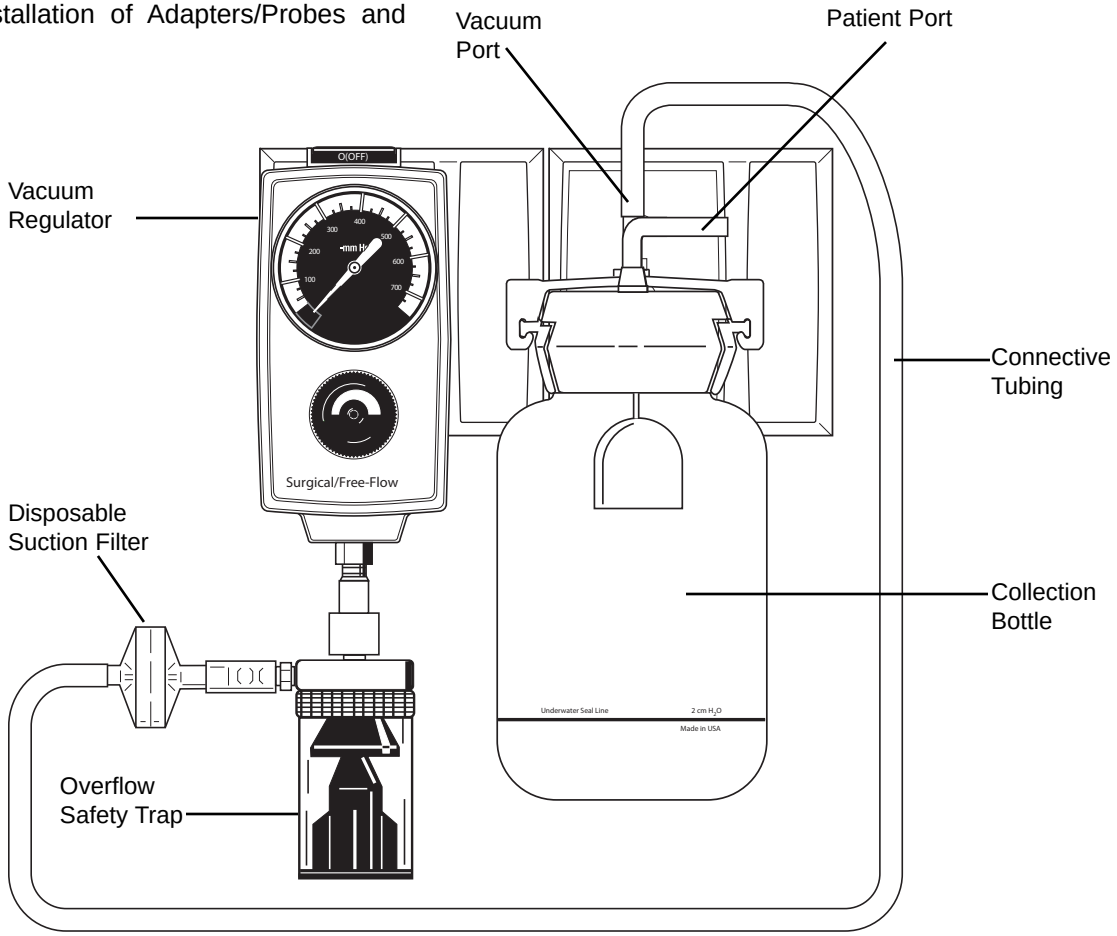
ISO 10079-3 (BS 7259: Part 2) states that "the usable volume of the collection container shall be not less than 500 ml (section 5.1.2.)."

**Suction Filters - Hydrophilic**

| | |
|---|---|
| Pkg of 20 | 6730-0350-800 |
| Pkg of 200 | 6730-0351-800 |

**Suction Filters - Hydrophobic**

| | **Tubing x tubing nipple** | **1/8" NPT x tubing nipple** |
|---|---|---|
| Pkg of 3 | 6730-0570-800 | 6730-0580-800 |
| Pkg of 10 | 6730-0571-800 | 6730-0581-800 |
| Pkg of 100 | 6730-0572-800 | 6730-0582-800 |



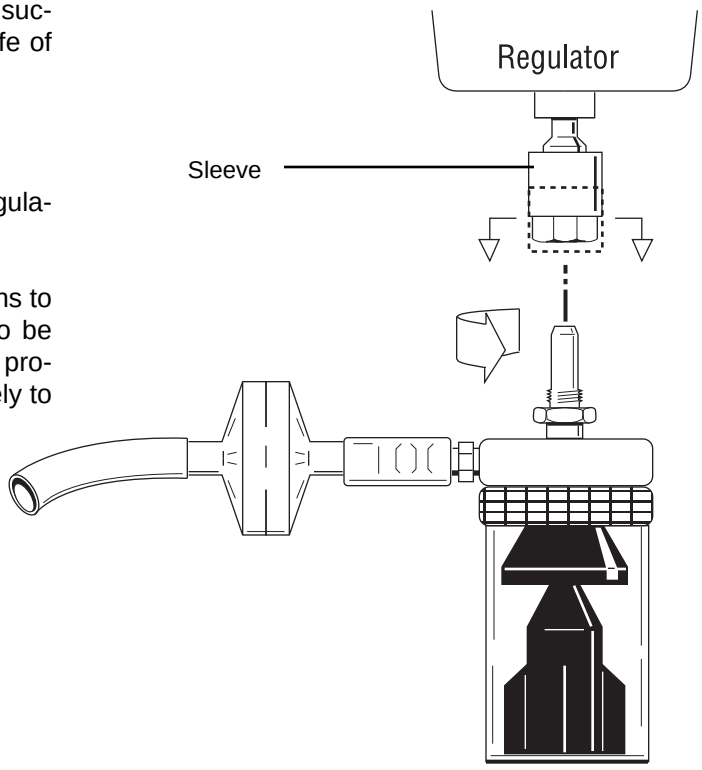

Equipment Set-up

## 4.1.1 Attaching the Safety Trap

⚠ **CAUTION:** To help prevent aspirate from entering the regulator, wall outlet and pipeline system as a result of misuse, an Overflow Safety Trap should be attached prior to its use. Aspirate in the regulator, wall outlet and pipeline system may impair their operation. The use of the Overflow Safety Trap and suction filter will help prevent this and extend the life of suction equipment.

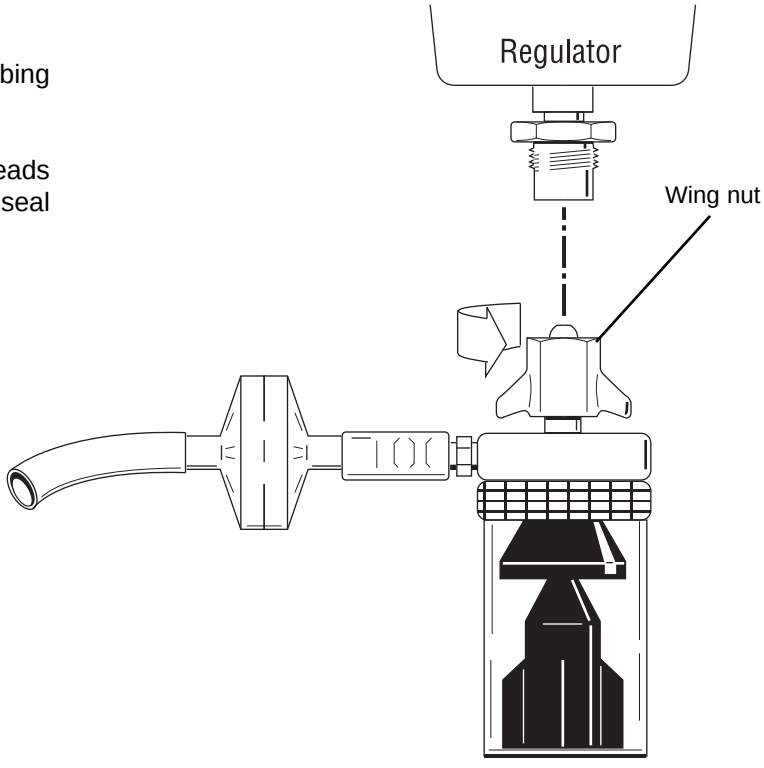
**Standard fitting**

1. Raise the sleeve and insert the trap into the regulator fitting.
2. Turn the trap clockwise about one and a half turns to engage the threads. The trap does not need to be screwed tight; an O-ring in the regulator fitting provides a vacuum seal. The trap should rotate freely to allow the desired tubing positioning.
3. Lower sleeve to lock trap in position.



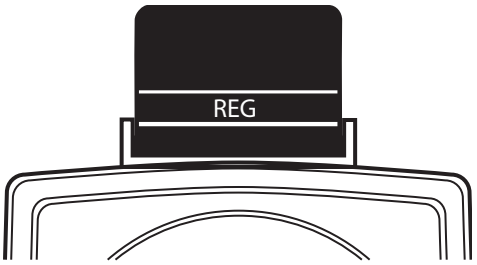

**DISS fitting**

1. Insert trap into the regulator fitting. Situate the tubing in the desired position.
2. Turn the DISS wing nut clockwise to engage threads and tighten (there is no O-ring, so the vacuum seal depends on a tight connection).

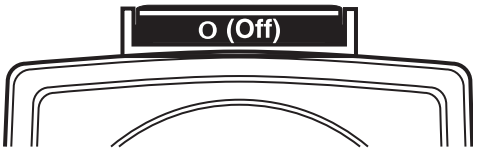


## 4.2 Mode Selection

REG/| - Suction can be adjusted with the suction control knob.




REG/|



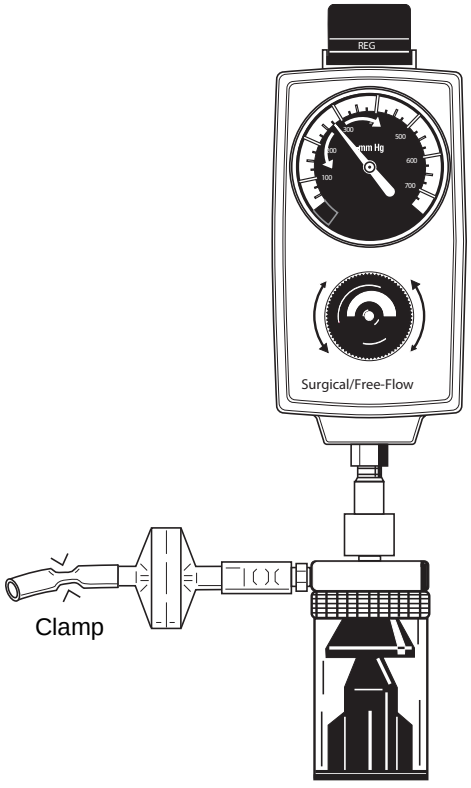

OFF/O - No suction is supplied to the patient.

OFF/O

## 4.3 Setting the Suction Level

**⚠WARNING: The fitting port of the regulator must be occluded when setting the prescribed suction level. This prevents the patient from receiving higher than required suction levels.**

1. Set the mode selector switch to REG/|.
2. Clamp the connective tubing to occlude the fitting port.
3. Rotate the suction control knob until the vacuum gauge indicates the required setting.



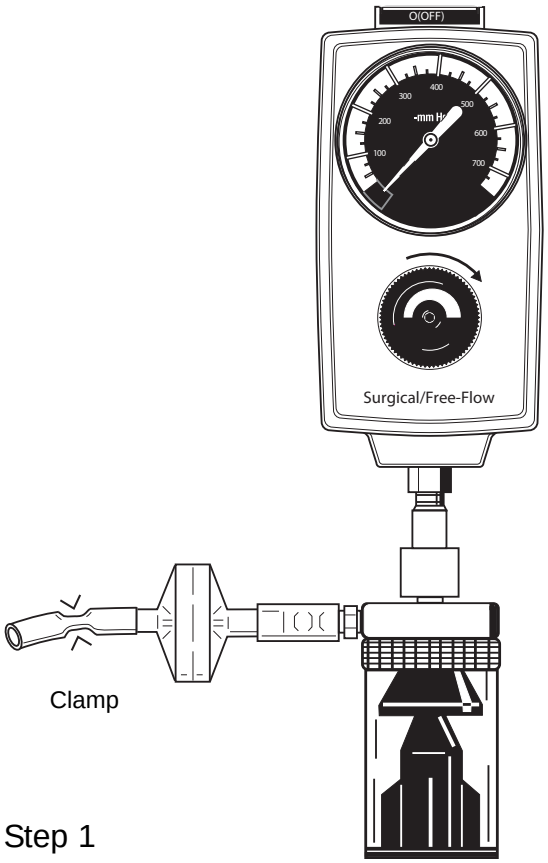
## 4.4 Pre-Use Checkout Procedure

**⚠WARNING: The Pre-Use Checkout Procedure must be performed before using this equipment on each patient. If the regulator fails any part of the Pre-Use Checkout Procedure, it must be removed from service and repaired by qualified service personnel.**

**⚠WARNING: Always connect the regulator to the vacuum source and check its operation before attaching the patient connection.**

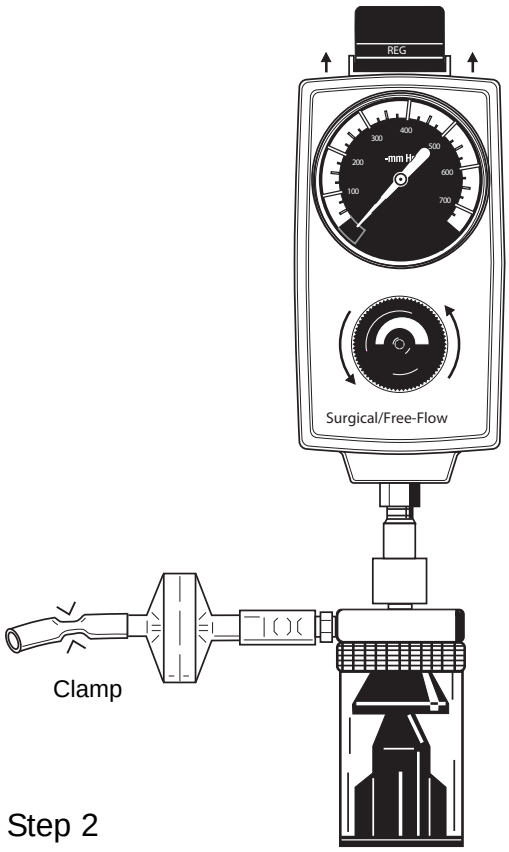
Before the Vacuum Regulator is used, it must be tested for correct operation as outlined below. All tests must be performed with the regulator in its normal (vertical) operating position and with a minimum supply vacuum of 15 in Hg/51 kPa (380 mm Hg).

1. Set the mode selector switch to OFF/O. Rotate the suction control knob 1/2 turn clockwise (increase). Clamp the connective tubing to occlude the fitting port. The gauge needle should not move.



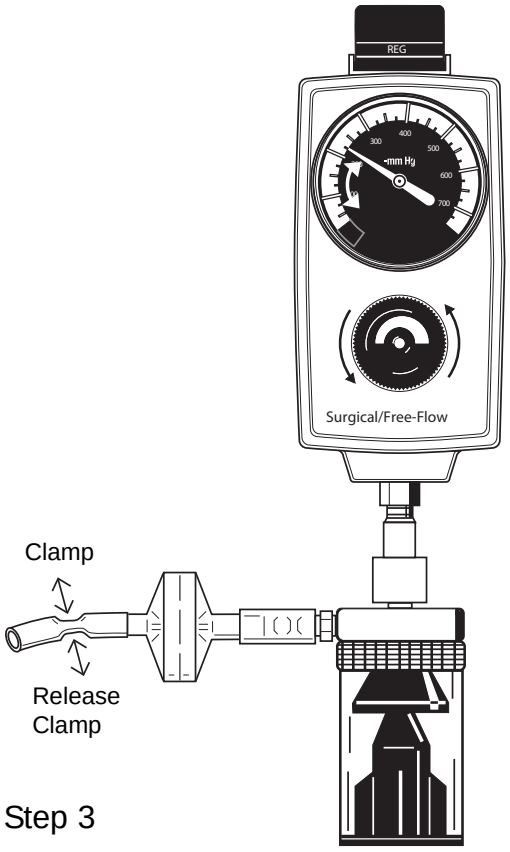

Step 1

2. Set the mode selector switch to REG/|. Rotate the suction control knob fully counterclockwise (decrease). Clamp the connective tubing. The gauge needle should not move.



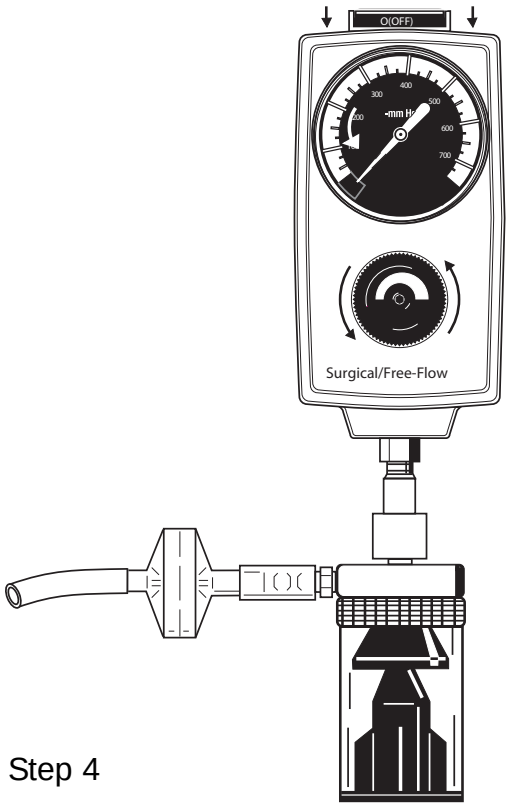

Step 2

3. Clamp the connective tubing. Increase the suction to 300 mm Hg/40 kPa. (For the Standard model, increase the suction to 100 mm Hg/13 kPa). Slowly open and close the clamped tubing to create various flow rates through the regulator. Ensure that the suction level is maintained when the tube is clamped




Step 3

4. Reduce the suction level to zero. Set the mode selector switch to OFF/O.




Step 4

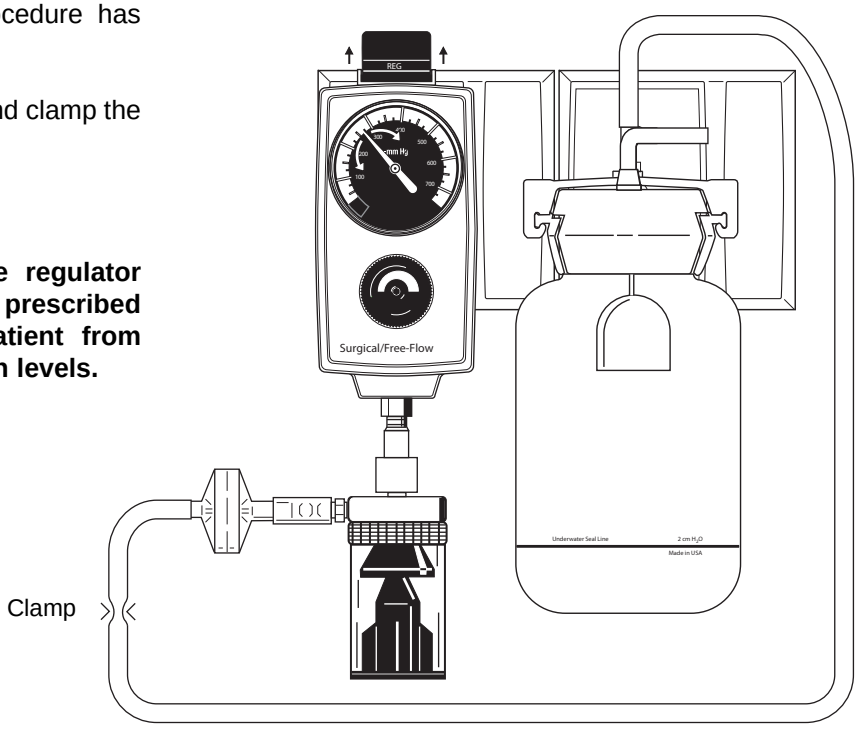
## 4.5 Patient Set-up

1. Make sure the Pre-Use Checkout Procedure has been performed.

2. Set the mode selector switch to REG/| and clamp the connective tubing.

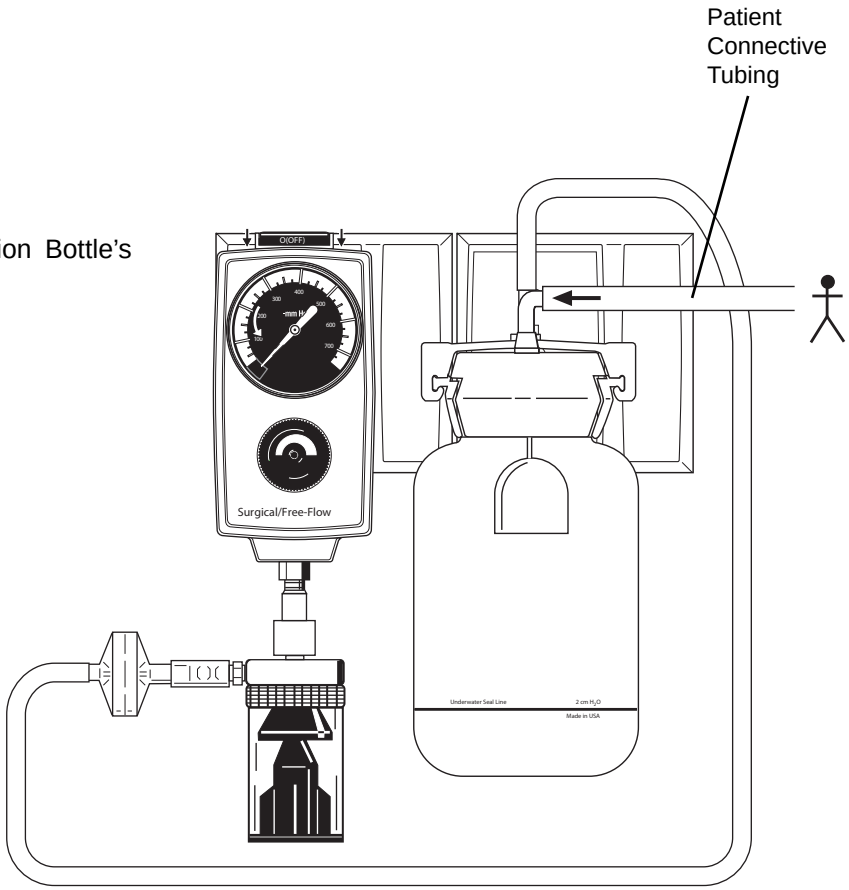
3. Set the prescribed suction level.

   **⚠WARNING: The fitting port of the regulator must be occluded when setting the prescribed suction level. This prevents the patient from receiving higher than required suction levels.**



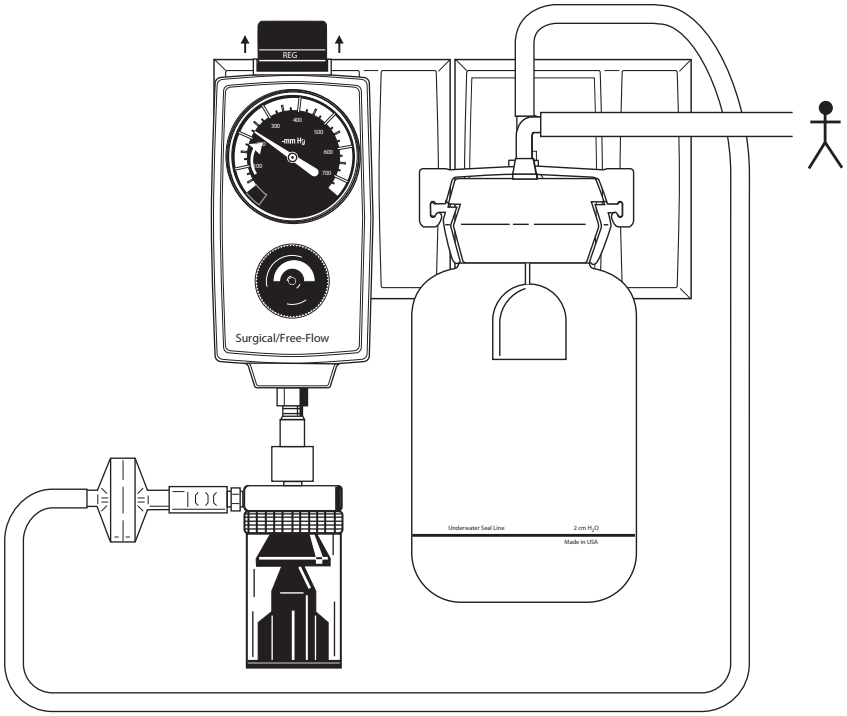

Steps 1 to 3

4. Set the mode selector switch to OFF/O.
5. Attach the patient tubing to the Collection Bottle's patient port.




Steps 4 and 5

6. Set the mode selector switch to REG/|.




Step 6

## 5.1 Cleaning

**⚠WARNING: After patient use, regulators may be contaminated. Handle in accordance with your hospital's infection control policy.**

5.1.1 Routine Exterior Cleaning

Routine cleaning of the regulator is recommended as a standard procedure after each use.

Wipe all exterior surfaces with a solution of water and mild detergent.

5.1.2 Internal Component Cleaning

**⚠CAUTION:** Cleaning the gauge may result in damage.

1. Refer to the Service - Disassembly and Assembly instructions.

2. All internal components, with the exception of the gauge, may be cleaned with a solution of warm water and mild detergent.

3. Dry all components with a lint free cloth before assembly.

## 5.2 Sterilization

Should misuse occur, resulting in accidental flooding of the regulator, the regulator may be sterilized using Ethylene Oxide (ETO). After sterilization, follow the service checkout procedures in Section 8.

**⚠WARNING: Following sterilization with ethylene oxide, parts should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the material. Aerate parts for 8 hours at 130oF (54oC)**

**⚠CAUTION:** Do not steam autoclave or liquid sterilize the Surgical/Free-Flow Vacuum Regulator. Severe impairment to the operation of the regulator will result. The only acceptable method of sterilization is with gas (ethylene oxide).

**⚠CAUTION:** Sterilization with ethylene oxide mixtures may cause crazing (minute superficial cracking) of some plastic parts. Crazing will be more pronounced when mixtures containing Freon® are used.

**Note:** The Vacuum Regulator should only be sterilized if it is contaminated or maintenance is to be performed.

1. The regulator should be sterilized with the mode selector switch in the REG/| position.

2. The only acceptable method of sterilization is with ethylene oxide. Ethylene oxide mixtures can be used at temperatures of 125 to 135°F (52 - 57°C). If this temperature cannot be obtained, room temperature sterilization with 100% ethylene oxide can also be used. Sterilization is not recommended as a standard procedure after each use.

3. After each sterilization check the condition of the filter. The filter is located just above the Fitting Port at the rear of the regulator. If the filter appears to have shrunk, replace it before placing the regulator back in service.

# 6/Troubleshooting

Place the regulator in the vertical position and connect to a supply vacuum of 15 in Hg/51 kPa (380 mm Hg).

| Problem | Possible Causes | Remedy |
|---|---|---|
| A. No gauge indication and no suction in any setting | 1. No supply vacuum<br>2. Kinked tube<br>3. Poor connection<br>4. Blocked adapter port<br>5. Blocked backplate<br>6. Blocked adapter | 1. Correct supply problems<br>2. Straighten tube<br>3. Check all connections and seals<br>4. Unblock port<br>5. Clean with soap and water and a bottle brush<br>6. Unblock/replace |
| B. No gauge indication but suction is being delivered | 1. Blocked gauge pressure sensing orifice<br>2. Gauge mechanism locked by debris<br>3. Gauge mechanism damaged<br>4. Tubing connected to bellows is blocked or disconnected | 1. Unblock orifice<br>2. Remove debris<br>3. Replace gauge<br>4. Unblock or reconnect tubing |
| C. Gauge indication but no suction is being delivered | 1. Blocked fitting port<br>2. Overflow Safety Trap shut-off<br>3. Blocked external filter<br>4. Blocked fitting | 1. Unblock port<br>2. Reset float and/or empty Overflow Safety Trap<br>3. Replace external filter<br>4. Replace fitting |
| D. Suction level cannot be adjusted | 1. Loose regulating bar<br>2. Tubing connected to bellows is blocked or disconnected<br>3. Damaged or loose valve tube | 1. Tighten regulating bar<br>2. Unblock or reconnect tubing<br>3. replace or reconnect valve tube |
| E. Inaccurate gauge reading<br><br>Note: All gauge needles should come to rest within the zero range bracket or return to the stop pin when no suction is being supplied. | 1. Damaged gauge | 1. Replace gauge |
| F. With the fitting port occluded, unable to decrease the suction level and gauge needle does not return to zero when switched to OFF/O | 1. Blocked filter and/or orifice<br>2. Damaged gauge | 1. Clear orifice and replace filter<br>2. Replace gauge |

| Problem | Possible Cause | Remedy |
|---|---|---|
| G. Mode selector switch sticks in OFF/O or REG/I position | 1. Dry or damaged o-rings | 1. Lubricate or replace and lubricate o-rings |
| | 2. Contaminated passage ways | 2. Remove and clean mode selector switch assembly |
| H. Insufficient flow through regulator | 1. Partial blockage in wall supply | 1. Confirm wall supply open air flow meets minimum hospital requirements<br><br>Unblock if necessary |
| | 2. Partial blockage in regulator | 2. Perform the Flow Test in the Service Checkout Procedure Section of this manual<br><br>Clear blockage if necessary |

# 7/Disassembly and Assembly

## 7.1 Service Tools and Equipment

⚠**CAUTION:** Use of lubricants other than recommended may degrade plastic or rubber components.

The following items should be on hand during any service procedure.

- Supply Vacuum: 500 mm Hg/67 kPa minimum and 50 LPM open air flow minimum
- Low Vacuum Calibration Gauge, 225 mm Hg/30 kPa Full Scale*(Ohio Medical P/N 6700-0353-800)
- High Vacuum Calibration Gauge, 760 mm Hg/101.3 kPa Full Scale*(Ohio Medical P/N 6700-0352-800)
- 50 LPM Flowmeter(Ohio Medical; P/N 6700-0355-800)
- Bubble Leak Tester
- Hexagonal Allen Wrench, 3/32 inch
- Phillips Head Screwdriver, No. 2
- Flat Head Screwdriver, 1/4 inch
- Open End Wrench, 5/16 inch
- Tweezers (Filter Remover)
- Wooden Toothpick (O-ring Remover)
- 3 Dow® 111 Grease
  (Ohio Medical P/N 6700-0074-200)
- Tubing Clamp
- Bottle Brush

## 7.2 Disassembly

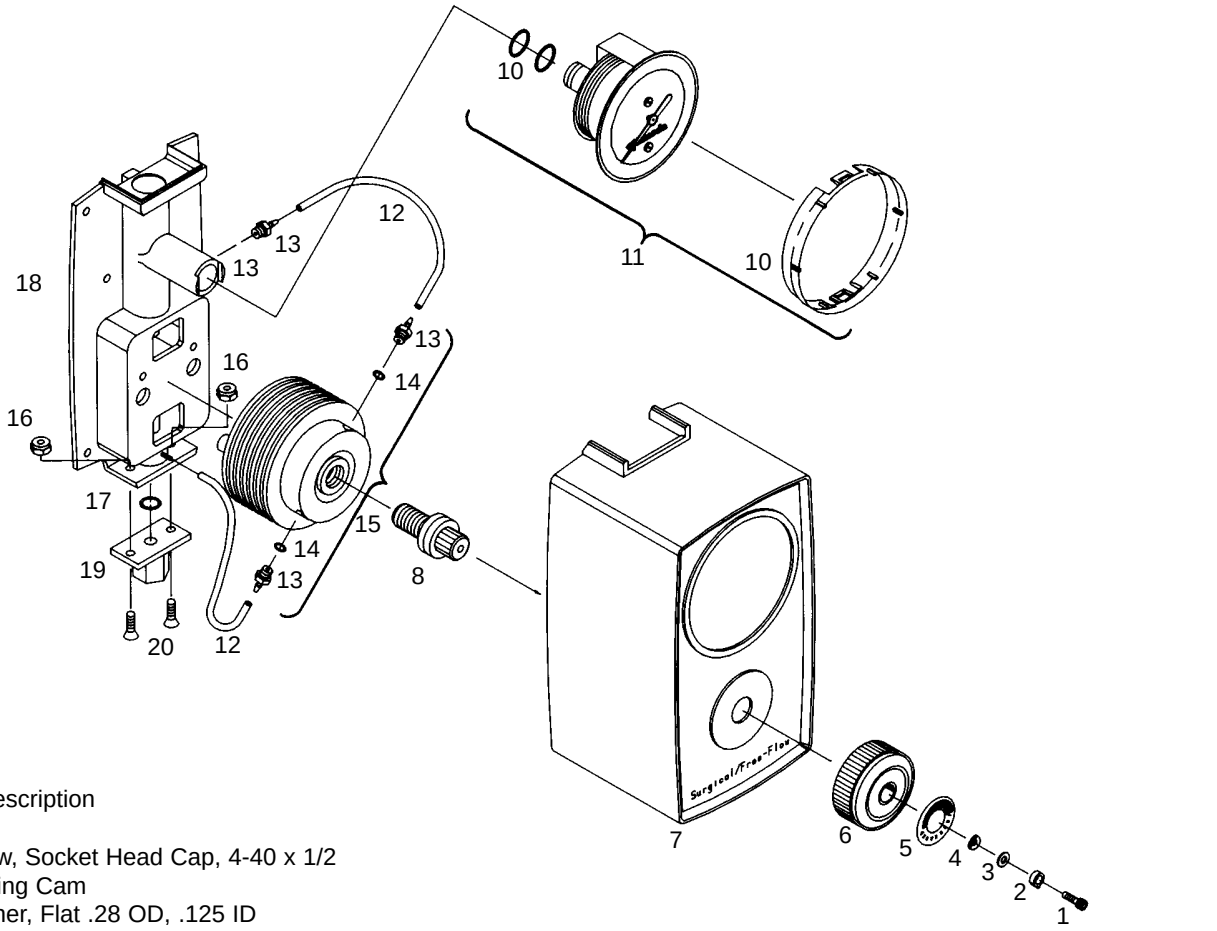
⚠**WARNING: If the Vacuum Regulator is repaired or disassembled in any manner, the Service Checkout Procedure must be performed before using the equipment on the patient.**

⚠**WARNING: Clean and sterilize all suction equipment if contaminated before disassembly, to ensure service personnel are not exposed to hazardous contamination.**

⚠**CAUTION:** The gauge assembly must be handled with utmost care to retain its precision. If the lens is removed, do not rest the gauge on its face.

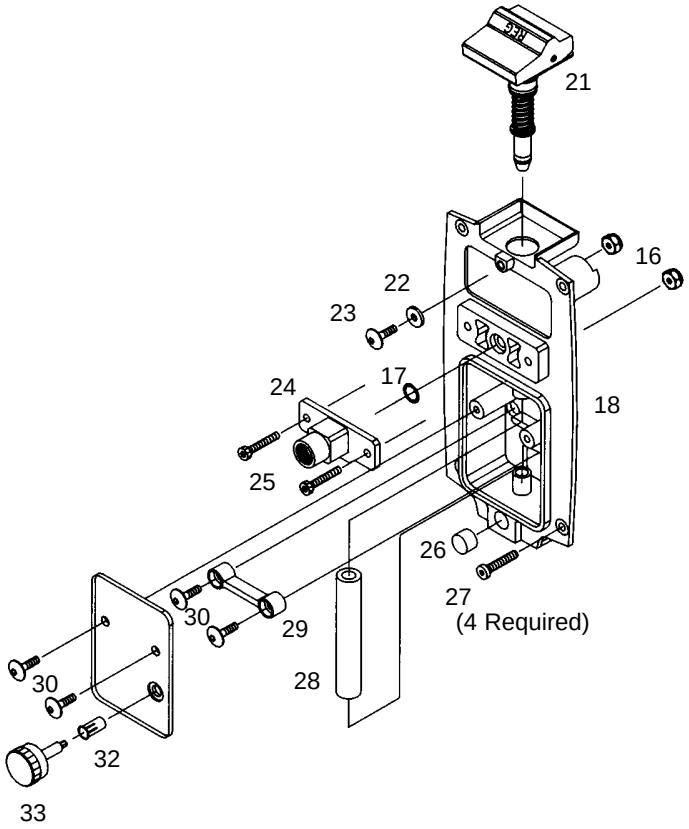
(*) Accuracy: ±1% of full scale deflection

3 Dow is the registered trademark of the Dow Chemical Corporation.




Item & Description

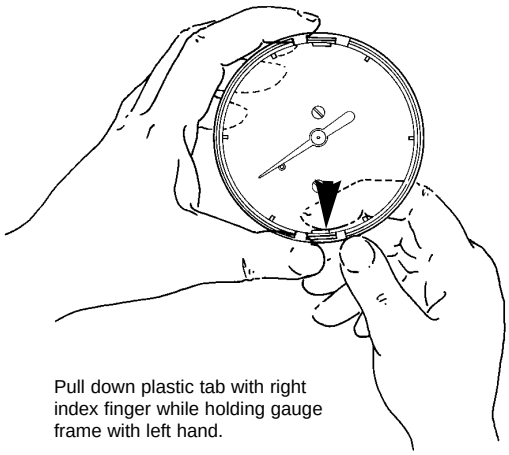
1. Screw, Socket Head Cap, 4-40 x 1/2
2. Locking Cam
3. Washer, Flat .28 OD, .125 ID
4. Spring Washer
5. Increase Label
6. Control Knob
7. Regulator Cover
8. Control Shaft
9. Snap Fit Lens
10. O-rings (2), Gauge
11. Gauge Assembly (Includes gauge, o-rings, and lens)
12. Tubing, .125 OD (2)
13. Adapter (3)
14. O-ring (3)
15. Bellows
16. Nut, Elastic Stop, 6-32
17. O-ring, 2-010, Buna-N
18. Surgical/Free-Flow Base
19. Bottom Connector
20. Screw, Flat Head 6-32 X 1/2 (2)
21. Selector Switch Assembly
22. Washer, Flat
23. Screw, Buttonhead Cap, 8-32 X 5/16
24. Inlet Connector, Universal
25. Screw, Round Head 6-32 X 7/8
26. Filter
27. Screw, No. 6 Pan Head (4)
28. Valve Tube
29. Regulating Bar
30. Screw, Buttonhead Cap 8-32 X 3/8 (4)
31. Rear Window
32. Tubular Speed Clip
33. Locking Knob



1. Remove the four screws located at the corners of the back cover. Hold the regulator with the front cover and knob facing upward. Rotate the suction control knob clockwise until the cover/knob assembly is free of the rest of the regulator.

2. Unscrew the cap screw from the suction control knob on the front cover. Pull the suction control knob off.

3. Carefully pull the gauge assembly out of its mount on the base. The snap fit lens can also be removed (If applicable).




Snap Fit Lens Removal

4. Remove the two small tubes which are connected from the bellows to the base.

5. Use the locking wrench to remove the two screws holding the rear window in place. Remove the window.

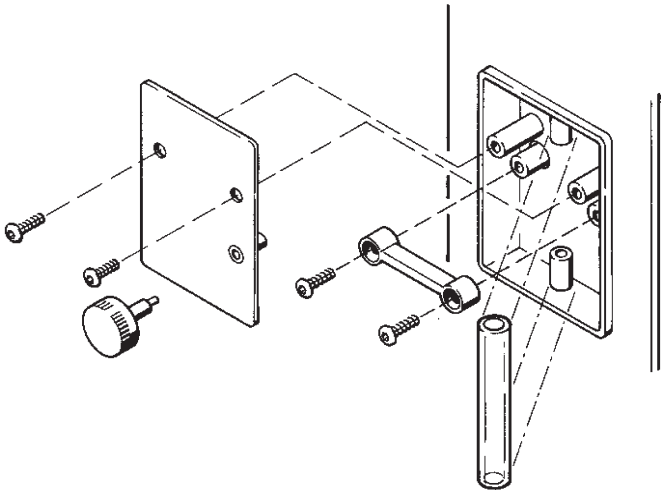
6. Locate the regulating bar inside the recessed enclosure. Unscrew the two retaining screws and remove the regulating bar and bellows.

7. Remove the valve tube from the recessed enclosure.

8. Remove the adapter and fitting ports and associated o-rings.

9. Pull the internal filter out of the socket using a pair of tweezers.

10. Loosen the screw that holds the selector switch assembly in position and pull the selector switch assembly out of the base.



Detail Back Cover

## 7.3 Assembly

⚠**CAUTION**: To prevent stripping the plastic threads, place the screw in the hole and turn counterclockwise until it drops into the original threads. Tighten screw.

1. Lubricate the adapter and fitting port o-rings. Assemble the adapter and fitting ports with appropriate o-rings to the base.

2. Install a new filter.

3. Connect the valve tube and install the bellows and regulating bar to the base.

4. Install the rear window. Use the locking wrench to tighten the two screws.

5. Connect the two small tubes from the bellows to the base.

6. Lubricate the selector switch assembly o-rings and fit into the base assembly. Tighten the retaining screw which holds the selector switch assembly in place. To prevent damage to the plastic base, do not over tighten the screw.

7. Lubricate the gauge assembly o-rings. Fit the gauge into the base assembly.

8. Place the knurled end of the control shaft through its hole in the front cover and slide the suction control knob onto the shaft. Place the curved spring washer and flat washer in the center hole of the knob.

9. Start the cap screw in the hole. Run the screw all the way in until the knob is locked in position. The locking cam should be in place on the screw head so that it seats against the tab in the control knob from a clockwise direction.

10. Loosen the cap screw one turn counterclockwise until the cam hits the tab on the control knob. If the suction control knob does not turn freely, loosen the cap screw.

11. Hold the base assembly with the bellows and gauge facing upward.

12. Place the cover over the base and engage the control shaft with the bellows by turning the suction control knob counterclockwise.

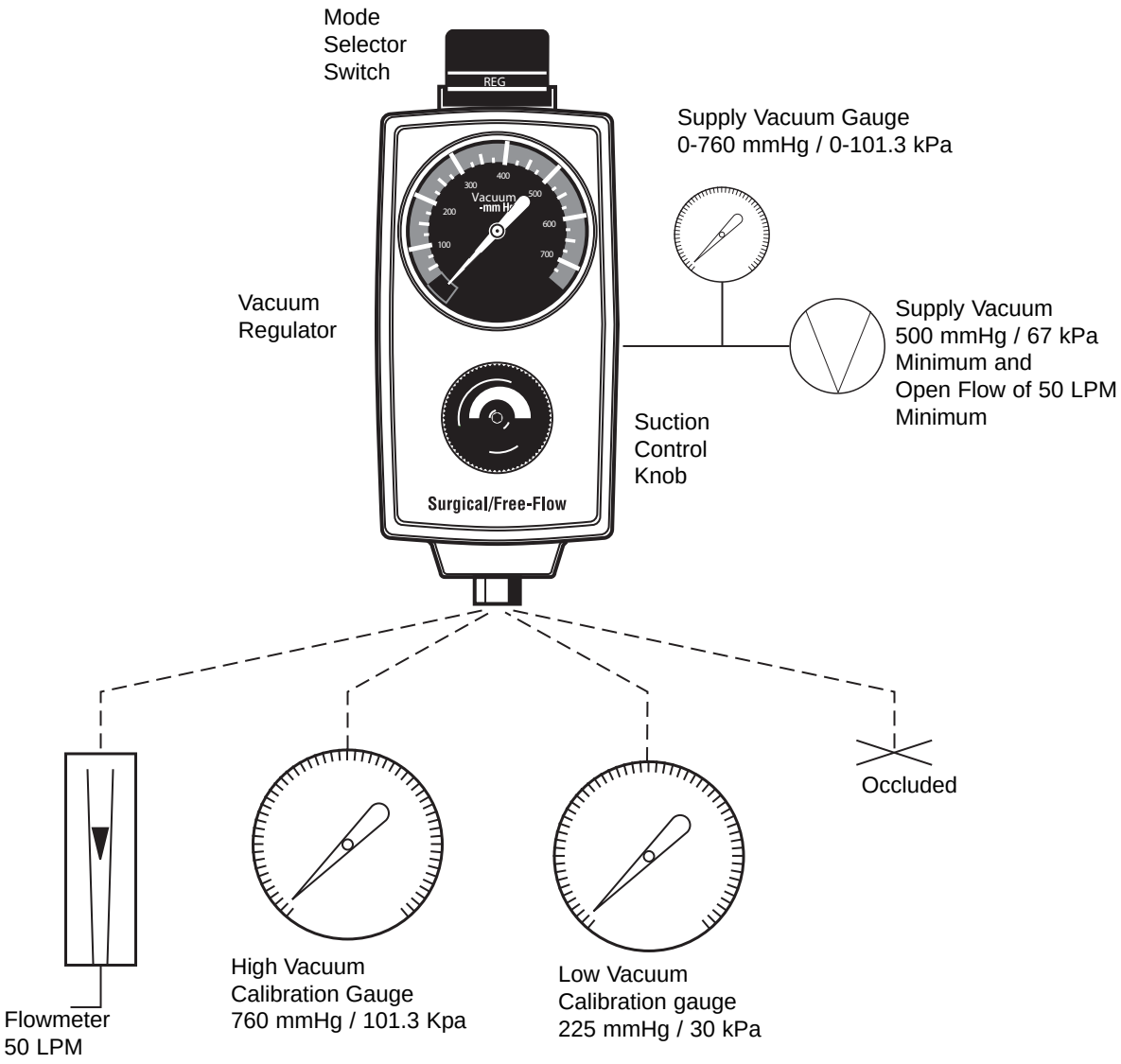
13. Install the four cover screws. To prevent stripping the plastic threads, place the screw in its hole and turn counterclockwise until it drops into its original threads, then tighten.

14. Perform the Service Check-out Procedure before returning the regulator to service.

# 8/Service Checkout Procedure

**⚠WARNING: If the Vacuum Regulator is repaired or disassembled in any manner, the Service Checkout Procedure must be performed before using the equipment on a patient.**

**Important:** This entire Service Checkout Procedure must be performed in numerical order.




Service Checkout Tests

## 8.1 Set-up

1. Verify that there is a minimum of 500 mm Hg/67 kPa vacuum on the supply gauge.

2. The supply open flow must be 50 LPM minimum.

3. Connect the supply vacuum to the adapter port.

## 8.2 Flow Test

1. Connect the regulator's fitting port to the flowmeter with tubing.

2. Set the mode selector switch to REG/| and rotate the suction control knob fully clockwise (increase).

3. Verify that the flow rate exceeds 30 LPM.

4. Set the mode selector to OFF/O.

5. Disconnect the flowmeter.

## 8.3 Gauge Test

**Note:** All Ohio Medical gauges are supplied with an accuracy of ±5% of full scale deflection throughout their range. The table below is provided for reference.

| Gauge | Range | Tolerance |
|---|---|---|
| Standard Vacuum | 0-200 mm Hg/ 0-26 kPa | ±10 mm Hg/ 1.3 kPa |
| High Vacuum | 0-760 mm Hg/ 0-100 kPa | ±38 mm Hg/ 5 kPa |

**Note:** All gauge needles should come to rest within the zero range bracket or return to the stop pin when no suction is being supplied. Gauge needles which do not comply may be out of calibration.

When checking gauge accuracy, be sure that the calibration gauge has an accuracy of 1% of full scale deflection or better.

8.3.1 High Vacuum Gauges ONLY

1. Connect the regulator's fitting port to the high calibration gauge with tubing.

2. Turn the mode selector switch to REG/|.

3. Assure that the gauge is in agreement with the high vacuum calibration gauge within the ± 38 mm Hg/5 kPa tolerance. Recommended test points are 100, 300, and 500 mm Hg.

8.3.2 Standard Vacuum Gauge ONLY

1. Connect the regulator's fitting port to the low calibration gauge with tubing.

2. Set the mode selector switch to REG/|.

3. Assure that the gauge is in agreement with the low vacuum calibration gauge within the ± 10 mm Hg/1.3 kPa tolerance. Recommended test points are 40, 80, and 140 mm Hg.

## 8.4 Regulation Test

1. Disconnect the calibration gauge and occlude the fitting port.

2. Depending on the type of regulator, perform one of the following.

   a. If using a High Vacuum Regulator (North American or International)
   Set the gauge to 300 mm Hg/40 kPa.

   b. If using a Standard Vacuum Regulator (North American)
   Set the gauge to 100 mm Hg.

3. Open and close the fitting port several times.

4. With the fitting port occluded, the gauge should return to the setting listed in step 1 within a tolerance of:
   38 mm Hg/5 kPa for the high vacuum gauge or
   10 mm Hg/1.3 kPa for the standard vacuum gauge

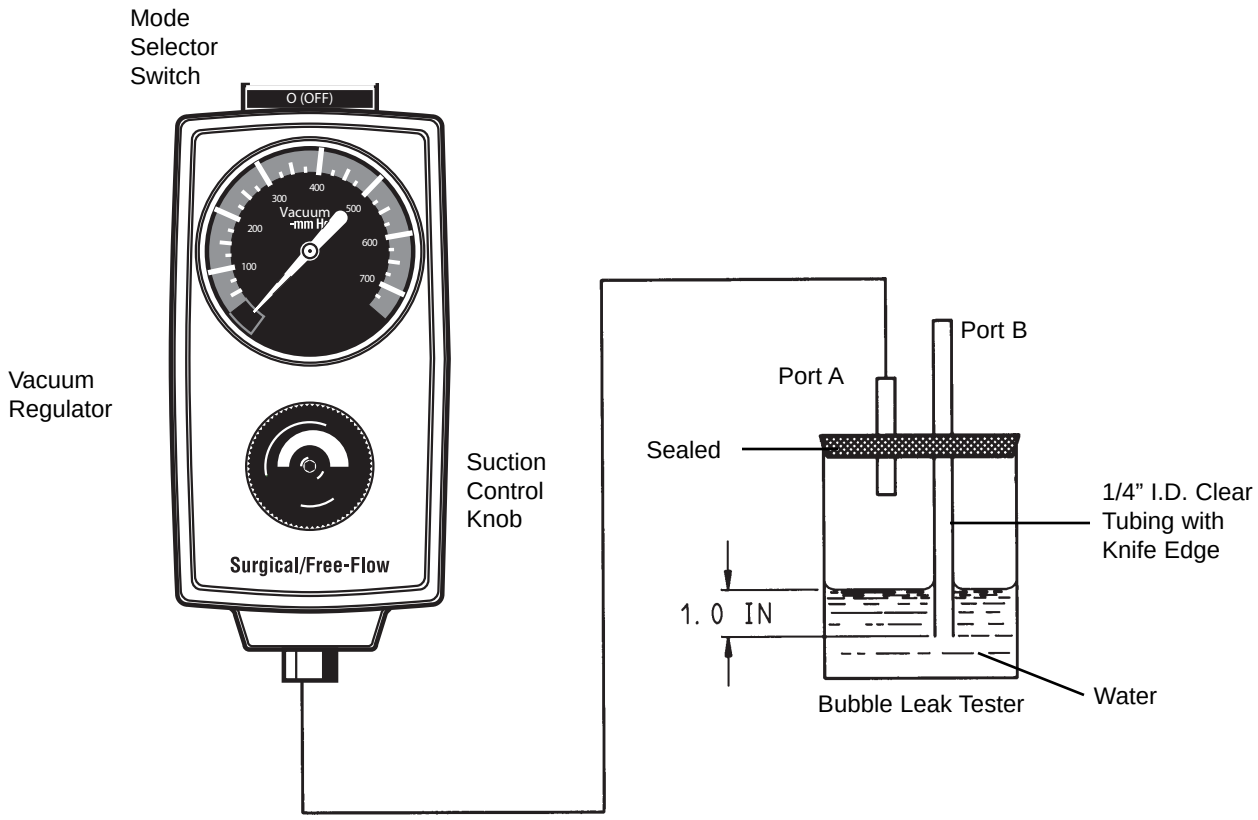
## 8.5 Bleed Test

1. Occlude the fitting port and set the vacuum level to 100 mm Hg/13 kPa.

2. Set the selector switch to OFF/O and observe the gauge needle. It must return to the zero range bracket or stop pin within 10 seconds.

## 8.6 Leak Test

1. Set the mode selector switch to OFF/O.
2. Connect the regulator fitting port to the Bubble Leak Tester port A with tubing.
3. Rotate the suction control knob 1/2 turn in the clockwise (increase) direction.
4. Observe the Bubble Leak Tester. No bubbles should appear.
5. Rotate the suction control knob fully in the counterclockwise (decrease) direction.
6. Set the mode selector switch to REG/|.
7. Observe the Bubble Leak Tester. No bubbles should appear.




Bubble Leak Test Set-Up

## 9.1 General Maintenance of Suction Equipment

**⚠WARNING: The Pre-Use Checkout Procedure must be performed before using this equipment on each patient. If the regulator fails any part of the Pre-Use Checkout Procedure, it must be removed from service and repaired by qualified service personnel.**

**⚠WARNING: Clean and sterilize all suction equipment if contaminated before disassembly, to ensure service personnel are not exposed to hazardous contamination.**
**Surgical/Free-Flow Vacuum Regulators should be kept in use or used on a rotating basis. Unused equipment may tend to deteriorate.**

Maintenance of the vacuum piping system is as important as maintenance of the suction equipment. The use of Collection Bottles with reliable shut-off valves, Overflow Safety Trap assemblies and Disposable Suction Filters will protect the regulator and piping system. The flow rate at the wall outlet should be checked on a yearly basis and suitable cleaning of the outlets should be performed. The flow rate measurement should meet local standards.

Routine maintenance and inspection are important to the performance of suction equipment. The following is a recommended list for care of suction equipment after each patient use.

1. Perform a thorough cleaning by washing all bottles, tubing, metal connectors, etc, and removing all residue.
2. Wipe all exterior surfaces with a solution of water and mild detergent.
3. Perform a careful visual inspection.
4. Check that the High Flow Disposable Suction Filter is clean and in good condition.
5. Check that all tubing is in good condition and connected securely to the correct ports.
6. Check the floats in the Overflow Safety Trap and Collection Bottle for correct operation.
7. Perform the Pre-Use Checkout Procedure.

## 9.2 Recommended Maintenance Schedule

In addition to the Pre-Use Checkout Procedure, the following periodic maintenance should be performed.

### 9.2.1 Maintenance Schedule

| Item | Minimum Frequency | Comments |
|---|---|---|
| Service Check-out Procedure | Every 4 months | If the regulator does not pass the Service Checkout Procedure, refer to the Troubleshooting Section of this manual. Repair as necessary |
| O-rings | Inspect every 4 months; Replace every 24 months | Replace as necessary to minimize in use failures. |
| Internal Filters Replace every 12 months | Inspect every 4 months; | Replace as necessary. Replacement interval will depend greatly on hours of usage and condition of operating environment. |
| Valve Tube | Inspect every 4 months | Replace as necessary |
| High Flow Disposable Suction Filter | Replace after each patient use | Replace more frequently if flow deteriorates |

## 9.3 Repair Policy

**⚠WARNING: Clean and sterilize all suction equipment before shipment or service to ensure transportation personnel and/or service personnel are not exposed to any hazardous contamination.**

**⚠CAUTION:** Do not steam autoclave or liquid sterilize the Surgical/Free-Flow Vacuum Regulator. Severe impairment to the operation of the regulator will result. The only acceptable method of sterilization is with gas (ethylene oxide).

**⚠CAUTION:** Only competent individuals trained in the repair of this equipment should attempt to service it.

Do not use malfunctioning equipment. Make all necessary repairs. Have the equipment repaired by qualified service personnel or by Ohio Medical. Parts listed in the service manual for this product may be repaired or replaced by a competent, trained person who has experience in repairing devices of this nature. After repair, perform the Service Checkout Procedure to ensure that it is functioning properly, and complies with the published specifications.

## 9.4 Technical Assistance

If technical assistance is required, contact Ohio Medical technical support or field operations listed on the back cover.

## 9.5 Return Instructions

1. Clean and sterilize the Vacuum Regulator.

2. Package the Vacuum Regulator securely for protection preferably in the original container.

3. Include a letter describing in detail any difficulties experienced with the Vacuum Regulator. Include the person, title, and telephone number to contact for functional questions.

4. Ohio Medical now offers a ten year warranty on vacuum regulators sold on or after July 1, 2005. If the vacuum regulator was purchased on or after July 1, 2005 and is less than ten years old or if the vacuum regulator is covered under the previous warranty and is less than five years old, include the warranty information that came with the device and a copy of the invoice.

5. Include a purchase order to cover repair of a regulator not under warranty.

6. Ship the Vacuum Regulator prepaid. Write your return address and billing address information on the package or letter that comes with the package.

   For U.S.A. Warranty Repairs (purchased on or after July 1, 2005 and is less than ten years old form the purchase date or if the vacuum regulator is covered under the previous warranty and is less than 5 years old from the purchase date) mail the package to:

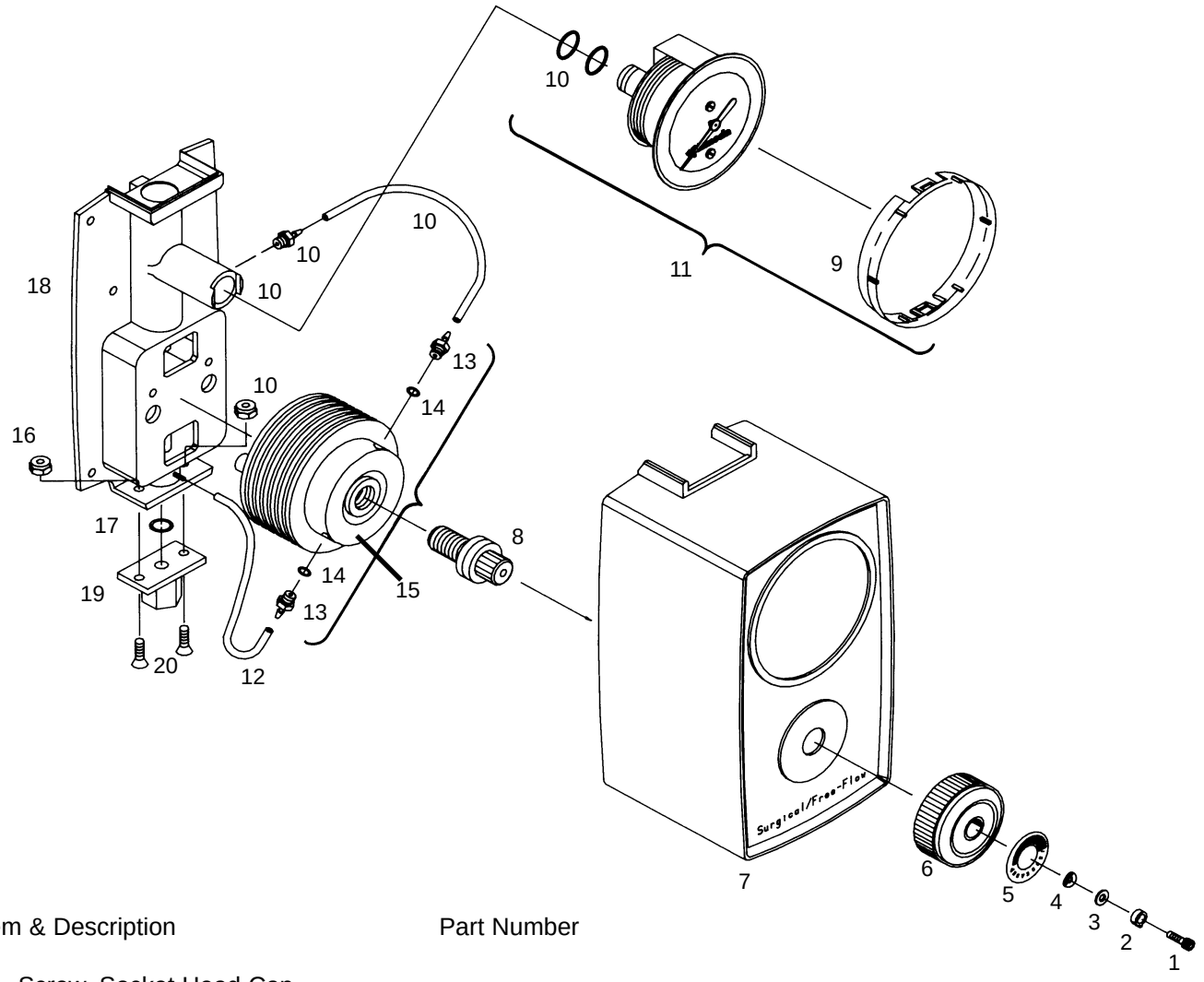
   Ohio Medical Corporation
   1111 Lakeside Drive
   Gurnee, IL 60031-4099

   For U.S.A. Non-Warranty Repairs (more than ten years older under the new warrant or more than five years sold under the previous warranty) mail the package to:

   Ohio Medical Corporation
   1111 Lakeside Drive
   Gurnee, IL 60031-4099 USA

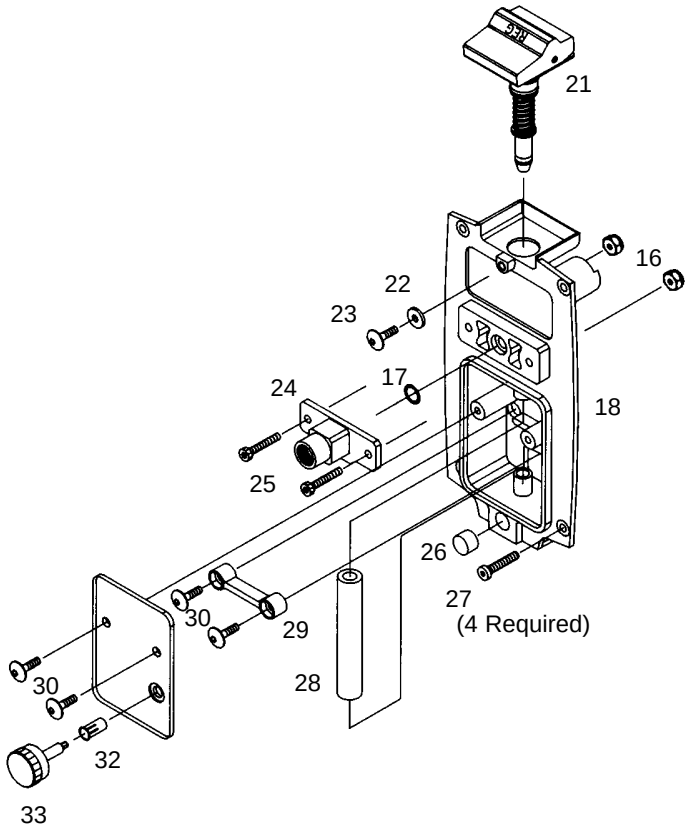
   In other locations contact your nearest Ohio Medical office or authorized Ohio Medical distributor.

## 10.1 Illustrated Parts




Item & Description — Part Number

1. Screw, Socket Head Cap, 4-40 X 1/2 . . . . . .6700-0170-400
2. Locking Cam . . . . . .0212-1705-300
3. Washer, Flat .28 OD, .125 ID . . . . .6700-0174-400
4. Washer, Spring . . . . . .6700-0148-400
5. Increase Label
   North American . . . . . .6700-0250-100
   International . . . . . .0206-5154-300
6. Control Knob . . . . . .0206-5187-300
7. Regulator Cover
   North American/English . . . . . .6700-0198-500
   French . . . . . .6700-0158-402
   Spanish . . . . . .6700-0158-401
8. Control Shaft . . . . . .0206-5188-300
9. Snap Fit Lens . . . . . .6700-0087-500
10. O-rings (2), Gauge . . . . . .6700-0130-500
11. Gauge Assembly (Includes gauge, o-ring, and lens)
    North American Standard . . . . . .6700-0050-200
    North American High . . . . . .6700-0050-201
    International High . . . . . .6700-0050-204
12. Tubing, .125 OD (2) . . . . . .0206-5186-300
13. Adapter (3) . . . . . .6700-0173-400
14. O-ring (3) . . . . . .0210-0593-300
15. Bellows Assembly (INcludes bellows, adapters and o-rings) . . . . . .6700-0165-700
16. Nut, Elastic Stop, 6-32 (4) . . . . . .6700-0175-400
17. O-ring, 2 . . . . . .6700-0131-500
18. Base Assembly (Includes base, adapter, and serial number label)
    North American . . . . . .6700-0161-700
    International . . . . . .6700-0162-700
19. Bottom Connector . . . . . .0206-5195-300
20. Screw, Flat Head
    6-32 X 1/2 (2) . . . . . .6700-0171-400

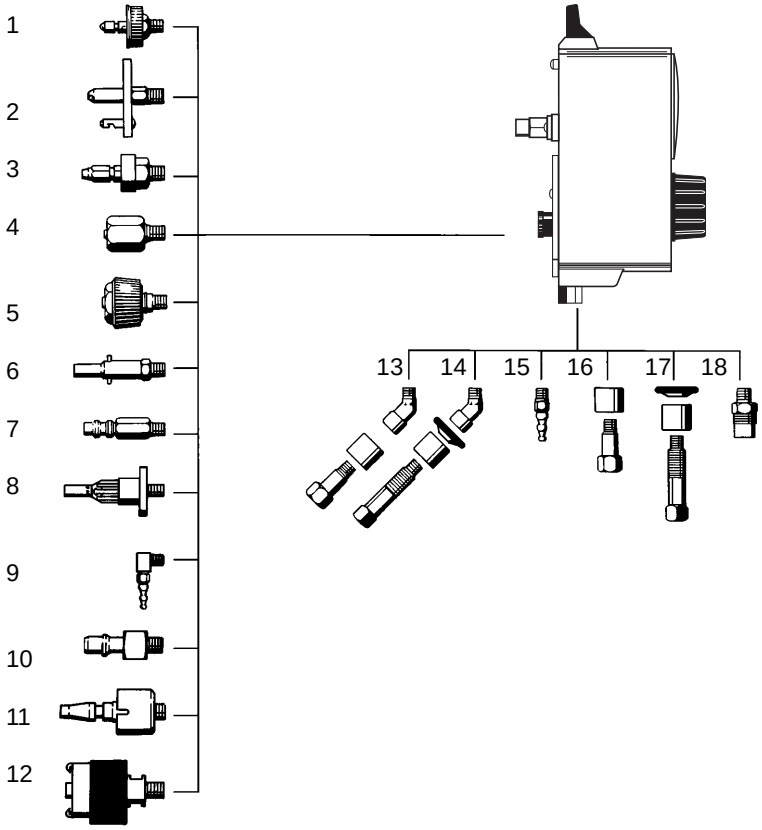



| Item & Description | Part Number |
|---|---|
| 21. Selector Switch Assembly | |
| North American | 6700-0067-700 |
| International | 6700-0067-701 |
| 22. Washer, Flat | 6700-0164-400 |
| 23. Screw, Buttonhead Cap, 8-32 X 5/16 | 6700-0165-400 |
| 24. Inlet Connector, Universal | 0206-5149-300 |
| 25. Screw, Round Head 6-32 X 7/8 | 6700-0176-400 |
| 26. Filter | 0206-5181-300 |
| 27. Screw, No. 6 Pan Head (4) | 6700-0151-400 |
| 28. Valve Tube | 0206-5182-300 |
| 29. Regulating Bar | 0206-5183-300 |
| 30. Screw, Buttonhead Cap 8-32 X 3/8 (4) | 6700-0172-400 |
| 31. Rear Window | 0206-5180-300 |
| 32. Tubular Speed Clip | 0206-5163-300 |
| 33. Locking Knob | 0212-1932-300 |

## 10.2 Service Kits

Selector Switch Assembly
Replacement Kit, . . . . . .6700-0013-200
Kit includes:
Buttonhead Screw, 8-32
Flat Washer
Selector Switch Assembly

## 10.3 Fittings and Adapters




Item & Description Part Number

1. Diamond Adapter . . . . . .0221-2685-802
2. NCG Adapter (Round) . . . . . .0221-0204-802
   NCG Adapter (Rectangle) . . . . . .0221-0205-800
3. Schrader Adapter . . . . . .0221-0690-731
4. DISS Union Nut & Gland . . . . . .6700-0094-700
5. DISS Hand-I-Twist Nut & Gland . . .0204-6717-800
6. OES Adapter . . . . . .0221-0152-300
7. Puritan Adapter . . . . . .0221-0106-300
8. Medstar Adapter . . . . . .0221-0163-300
9. 90° Tubing Nipple . . . . . .6700-0095-700
10. Drager Adapter . . . . . .6700-0051-700
11. BOC IV Adapter . . . . . .6700-0057-700
12. Air Liquide Adapter . . . . . .6700-0091-400
13. 45° Locking Gland . . . . . .6700-0143-700
14. 45° Threaded Locking Gland . . . . .6700-0141-700
15. Tubing Nipple . . . . . .0204-9020-535
16. Locking Gland . . . . . .6700-0144-700
17. Threaded Locking Gland . . . . . .6700-0142-700
18. DISS Male . . . . . .0204-7989-535

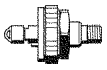
## 10.4 North American

10.4.1 Regulator Options
Instructions: Select the adapter, vacuum regulator, and fitting to form an 11-digit part number.

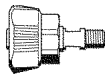
| Example: 6701-1246-901 = | 6701 | 1246 | 901 |
|---|---|---|---|
| | Diamond Adapter | Standard Surgical/Free-Flow | Tubing Nipple |

### Adapters 67XX

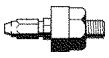
No Adapter

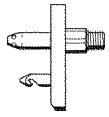

6700
1/8” NPT Female

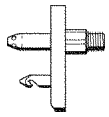

6701
Ohio Diamond

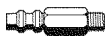

6702
Hand-I-Twist

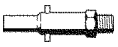
6703
DISS Nut & Gland

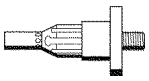

6704 Schrader

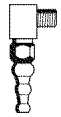

6705
NCG Rectangle


6706
NCG Round

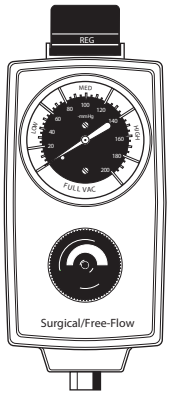

6707
Puritan-Bennett


6708
OES

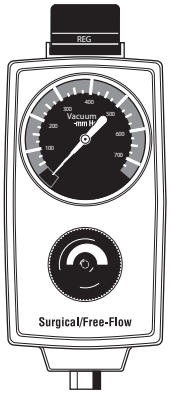

6709
MedStar


6711
90° Tubing Nipple

### Regulator 12XX




**1246**
Standard
Surgical/Free-Flow



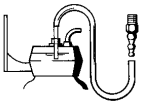

**1247**
High
Surgical/Free-Flow

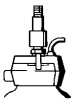
### Fittings 9XX

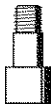
No Fitting

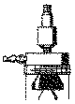
900
1/8” NPT Female

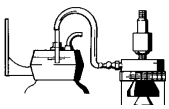
901
Tubing Nipple


902
Tubing Nipple and 1/2 Gallon Bottle, with Wall Slide (Straight)

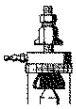

903
Locking Gland and 1/2 Gallon Bottle, with Floor Bracket

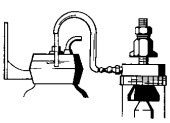

904
Locking Gland


905
Locking Gland and Overflow Safety Trap


906
Locking Gland and overflow Safety Trap and 1/2 Gallon Bottle, with Wall Slide (Straight)

907
DISS Male


908
DISS Male & Overflow Safety Trap, DISS Wing Nut & Gland

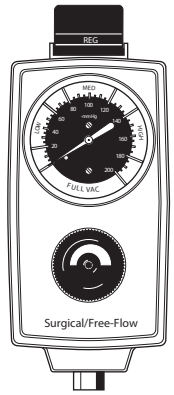

909
DISS Male, Overflow Safety Trap and 1/2 Gallon Bottle, with Wall Slide (Straight)

10.4.2 Other Options (North American)

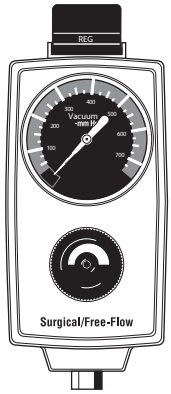
Instructions: Select the desired configuration and write down the first four and the last three digits of the part number. Select the vacuum regulator desired (below) and insert the middle four digits in the "XXXX" section of the selected 11-digit part number.

Example: 6713-1246-907 = Standard Surgical/Free-Flow Regulator with Rail Bracket

## Regulator 12XX

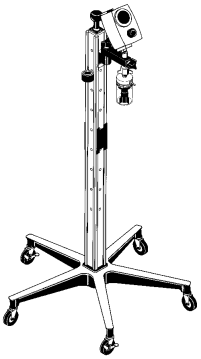



**1246**
Standard
Surgical/Free-Flow

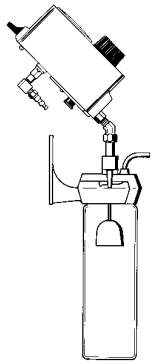



**1247**
High
Surgical/Free-Flow

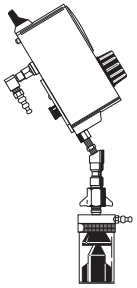
## Options for Multi-Purpose Therapy Stand (MPTS) and Additional Accessories



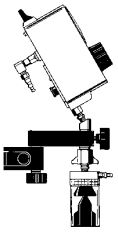
MPTS, Regulator, MPTS Slide Brackets (2) & Retaining Clips (2), Overflow Safety Trap
6711-XXXX-914



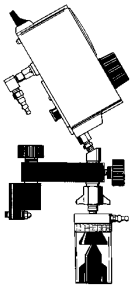
Regulator, Bracket, and 1/4 Gallon Bottle, 45° Locking Gland
6711-XXXX-916



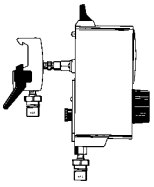
Regulator with 30° Fitting, Overflow Safety Trap
6711-XXXX-930



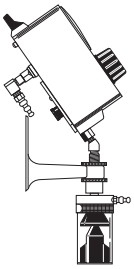
Regulator and Dovetail Bracket, Overflow Safety Trap
6711-XXXX-935



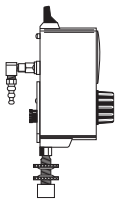
Regulator & MPTS (Slide) Bracket, Overflow Safety Trap
6711-XXXX-913



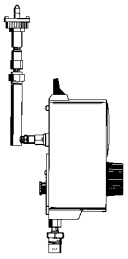
Regulator & Rail Bracket, DISS Male
6713-XXXX-907



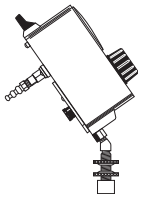
Regulator & MPTS (Slide) Bracket, Threaded Gland, 45° Fitting, Overflow Safety Trap
6711-XXXX-915



Regulator and Locking Gland (Threaded)
6711-XXXX-919



Regulator with Ceiling Mount, DISS Male
6712-XXXX-907



Regulator with 45° Locking Gland (Threaded)
6710-XXXX-910

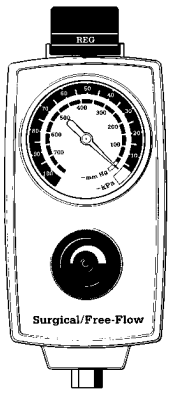
## 10.5 English, French, and Spanish

10.5.1 Regulator Options

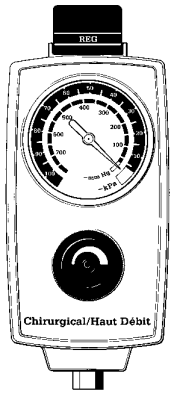
Instructions: Select the vacuum regulator and fittings to form an 11-digit part number.

Example: 6700-1248-901 = Surgical/Free-Flow Regulator w/Tubing Nipple

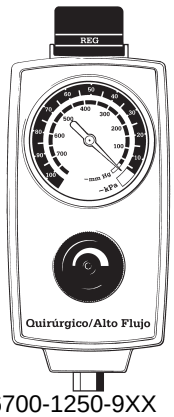
### Adapters 6700-12XX-9XX




6700-1248-9XX
Surgical/Free-Flow
(English)




6700-1249-9XX
Surgical/Free-Flow
(French)



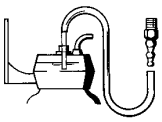

6700-1250-9XX
Surgical/Free-Flow
(Spanish)

### Inlet Fittings 6700-12XX-9XX

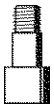
6700-12XX-900
w/o Inlet Fittings

6700-12XX-901
w/Tubing Nipple

6700-12XX-902
w/Tubing Nipple,
12" Tubing,
1/2 gal. Bottle,
Cap & Float
Assembly and Wall
Slide (Straight)

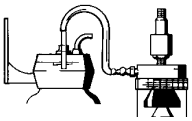


6700-12XX-904
w/Locking Gland

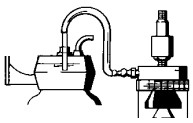


6700-12XX-905
w/Locking Gland and
Overflow Safety Trap

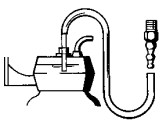
6700-12XX-906
w/Locking Gland,
Overflow Safety Trap,
12" Tubing, 1/2 gal. Bottle,
Cap & Float Assembly and
Wall Slide (Straight)



6700-12XX-911
w/Locking Gland,
Overflow Safety Trap,
12"Tubing, 1/2 gal.
Bottle, Cap & Float
Assembly and Wall
"V" Slide
(International)

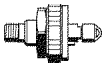


6700-12XX-912
w/Tubing Nipple,
12" Tubing, 1/2 gal. Bottle,
Cap & Float Assembly and
Wall "V" Slide
(International)

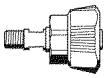


### Probes

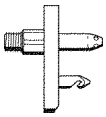
0221-2685-802
Diamond



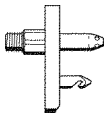
0204-6717-800
Hand-I-Twist



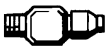
0221-0205-800
NCG (Rectangle)



0221-0204-802
NCG (Round)



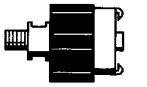
0221-0106-300
Puritan



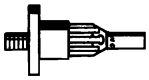
6700-0051-700
Drager

6700-0057-700
BOC IV

6700-0091-400
Air Liquide



0221-0163-300
MedStar



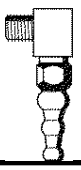
0204-9020-535
Tubing Nipple

0221-0152-300
OES

0221-0690-731
Schrader

6700-0094-700
DISS Nut & Gland

6700-0095-700
90° Tubing Nipple

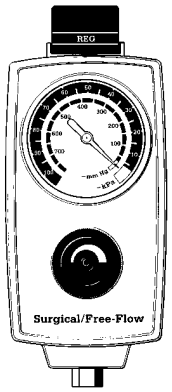


### 10.5.2 Other Options (English, French, and Spanish)

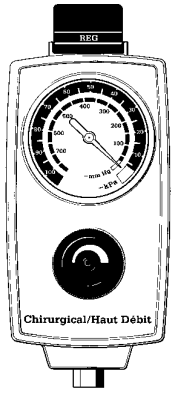
Instructions: Select the desired configuration and write down the first four and the last three digits of the part number. Select the vacuum regulator desired (below) and insert the middle four digits in the "XXXX" section of the selected 11-digit part number.

**Example: 6711-1248-913** = Surgical/Free-Flow Regulator (English) with MPTS (Slide) Bracket and Overflow Safety Trap

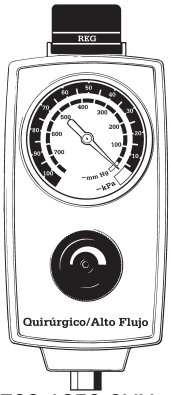
## Regulator 12XX




6700-1248-9XX
Surgical/Free-Flow
(English)

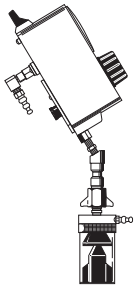



6700-1249-9XX
Surgical/Free-Flow
(French)

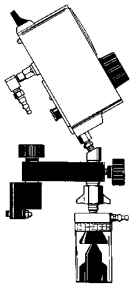



6700-1250-9XX
Surgical/Free-Flow
(Spanish)

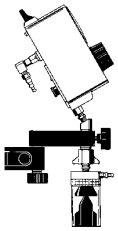
## Options for Additional Accessories



Regulator with 30° Fitting, Overflow Safety Trap
6711-XXXX-930



Regulator & MPTS (Slide) Bracket, Overflow Safety Trap
6711-XXXX-913



Regulator and Dovetail Bracket, Overflow Safety Trap
6711-XXXX-935

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